

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence; and the monthly ranges:

Heights of rivers above low-water mark, February, 1893.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Shreveport, La.	29.9	16.0	1	9.9	17	6.1
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	10.0	24	2.6	7	7.4
Little Rock, Ark.	23.0	13.7	25	6.4	10, 14	7.3
<i>Missouri River.</i>						
Fort Buford, N. Dak. *	21.0					
<i>Mississippi River.</i>						
Pierre, S. Dak. *	14.0					
Sioux City, Iowa *	18.7					
Kansas City, Mo. *	21.0					
<i>Mississippi River.</i>						
Saint Paul, Minn. *	14.0					
La Crosse, Wis. *	11.8					
Dubuque, Iowa *	16.0					
Davenport, Iowa *	15.0					
Keokuk, Iowa *	14.0					
Hannibal, Mo.	17.0	4.8	18, 19	2.8	2	2.0
Saint Louis, Mo. *	30.0					
Cairo, Ill.	40.0	44.9	28	6.7	1	38.2
Memphis, Tenn.	33.0	32.3	28	3.2	1	29.1
Vicksburg, Miss.	41.0	38.0	28	6.2	1-4	31.8
New Orleans, La.	13.0	12.6	28	3.7	15	8.9
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	38.0	11	10.5	27	27.5
Cincinnati, Ohio.	45.0	54.9	20	22.2	28	32.7
Louisville, Ky.	24.0	28.8	22	9.0	28	19.8
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	40.8	22	7.0	10	33.8
<i>Tennessee River.</i>						
Chattanooga, Tenn.	33.0	33.4	20	6.1	9	27.3
Knoxville, Tenn.	29.0	18.0	18	3.6	27	14.4
<i>Monongahela River.</i>						
Pittsburg, Pa.	29.0	23.1	8	5.3	27, 28	17.8
<i>Savannah River.</i>						
Augusta, Ga.	32.0	25.0	14	7.6	24	17.4
<i>Willamette River.</i>						
Portland, Oregon.	15.0	8.8	14, 15	1.2	1	7.6
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0	11.6	12	2.7	1	8.9
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	42.6	19	4.6	10, 11	38.0
<i>James River.</i>						
Lynchburg, Va.		7.0	18	1.3	8-10	5.7
<i>Sacramento River.</i>						
Red Bluff, Cal.		12.5	4	4.0	2	8.5
Sacramento, Cal.		25.0	12	21.5	28	3.5

* River frozen.

FLOODS.

On the 7th and 8th the rivers rose rapidly at Pittsburg, Pa. The rise was from the Allegheny River, and was principally backwater in the Monongahela River. The Monongahela River gauge read 16.4 feet at 8 a. m. of the 7th, 19.8 feet at 1.30 p. m., and 23.8 feet at midnight of the 7th. The Allegheny River continued to rise during the 8th, reaching 25 feet at 6 a. m., and the Monongahela River rose until 3 a. m. of the 8th, when a stage of 24 feet was reached. Rivers and streams were high throughout eastern Ohio, Pennsylvania, and New York. On the 8th the Ohio River was rising rapidly at Parkersburg, W. Va., reaching 28.5 feet, and on the 9th cellars in low-lying parts of the city were flooded.

On the 9th streams in Ohio and Indiana were flooding their banks, and high water was reported in the San Joaquin River, California, and tributaries. The Kern River overflowed its banks at Bakersfield, Cal., about midnight, damaging railroad and other property. Large tracts of land in the San Joaquin and Santa Clara valleys were reported flooded. On the 10th the river continued to rise at Parkersburg, W. Va.; low lands and many roads in that section were submerged; and Riverside, a suburb, was surrounded by water.

On the 11th the Ohio River reached the danger-line, 38 feet, at Parkersburg, W. Va. During the 12th and 13th the river was falling at Parkersburg. At Cincinnati, Ohio, the Ohio River passed the danger-line, 45 feet, on the 11th, reached a

stage of 53 feet on the 16th, then fell until the 18th, rose to 54.9 on the 20th, and subsided from the 21st to the close of the month, passing below the danger-line on the 23d. Low-lying sections of Cincinnati and suburbs were inundated.

At Louisville, Ky., the river reached the danger-line, 24 feet, on the 14th, reached a stage of 28.8 feet on the 22d, and passed below the danger-line on the 24th. At Evansville, Ind., the river reached the danger-line, 30 feet, on the 12th, rose to 41.8 feet on the 24th, and at the close of the month stood at 35.7 feet on the gauge. At Cairo, Ill., the danger-line, 40 feet, was passed on the 20th, and at the close of the month a stage of 44.9 feet was reported at that place.

High water was reported in rivers and streams of Georgia and Alabama after the 16th. At Gadsden, Ala., the Coosa River was 19.4 feet, 1.4 foot above the danger-line, on the 16th, reached a stage of 21.5 feet on the 17th and 18th, and on the 24th stood at 14.5 feet on the gauge. At Demopolis, Ala., the Tombigbee River was 36 feet, 1 foot above the danger-line, on the 16th, reached 50.4 feet on the 25th, and at the close of the month a stage of 49.3 feet was reported. The Tennessee River rose 0.4 foot above the danger-line at Chattanooga, Tenn., on the 20th. The Cumberland River rose above the danger-line, 40 feet, at Nashville, Tenn., on the 21st, reached 40.8 feet on the 22d, and passed below the danger-line on the 23d.

ICE IN RIVERS AND HARBORS AND CLOSING OF NAVIGATION.

On the 5th the harbor at Provincetown, Mass., was reported frozen for the first time this winter. On the 4th a steamer forced a passage through the ice from New London, Conn., to Norwich; this was the first trip between those points since January 16th. An ice gorge formed in the Connecticut River near Allans Point on the 13th, and large quantities of running ice passed New London. Ice passed out of the Delaware River at Port Jervis, N. Y., on the 11th. On the 11th ice in the Hudson River opposite Troy N. Y., broke up and moved to Van Rensselaer Islands, where a gorge formed. On the 10th ice in the Raritan River at New Brunswick, N. J., broke and began to move at 3 p. m. in cakes 8 to 12 inches in thickness, without causing material damage.

On the 10th an ice jam in the Delaware River at Lambertville, N. J., broke. At Lock Haven, Pa., the Susquehanna River was frozen on the 1st; on the 7th ice moved out of the river at that point; 16-18th, slush ice in river; 21st, river frozen. Ice gorged in the Clarion River at Clarion, Pa., on the 4th; 7th, ice gorge broke; 27th, ice gorged. The Susquehanna River opened at Harrisburg, Pa., on the 10th. Ice moved out of the Susquehanna at Wilkesbarre, Pa., on the 11th, but lodged between that point and Plymouth. Ice passed out of the Susquehanna at Selins Grove, Pa., on the 11th. Ice in the upper part of Chesapeake Bay was reported moving on the 2d.

Annapolis harbor was reported practically clear of ice on the 3d. On the 10th ice in the Susquehanna commenced to break up at Port Deposit, Md., and a gorge formed. On the 14th the ice gorge began to move, and water flooded a part of Port Deposit. An ice gorge was also reported near Havre de Grace, Md. Floating ice was reported in the Roanoke River at Weldon, N. C., on the 1st and 2d. The Cumberland River opened at Riddleton, Tenn., on the 1st. Ice in the Maumee River broke and gorged about 2 miles above Toledo, Ohio, on the 10th. Navigation was resumed on the Monongahela River at Greensboro, Pa., on the 2d. Floating ice was reported in the Allegheny River at Freeport, Pa., on the 1st and 18th to 28th. Ice broke up in the Allegheny at Oil City, Pa., on the 7th.

Ohio River.—At Parkersburg, W. Va., ice was running from the 1st to the 5th, and navigation was resumed on the 4th;

5th, river clear of ice at night; 21st to 27th, running ice. At Wheeling, W. Va., heavy floating ice was reported on the 9th, 17th, and 18th. At Portsmouth, Ohio, heavy running ice was reported on the 1st and 2d; 3d, navigation resumed; 3d to 6th, light running ice; 11th, heavy running ice and drift; navigation opened at Cincinnati, Ohio, on the 4th; 20th, canal frozen at Cincinnati. Heavy floating ice was noted at Marietta, Ohio, on the 1st to 6th, and 22d to 27th. At Louisville, Ky., ice was running on the 1st and 2d; 3d, ice moving out rapidly, and navigation partly resumed; 4th, river clear of ice and navigation fully resumed. Floating ice was noted at Paducah, Ky., from the 3d to the 13th. Heavy running ice was reported at Evansville, Ind., on the 4th. On the 5th an ice gorge broke at Carrsville, Ky.; at Golconda, Ill., the river was full of floating ice and rising rapidly, and about 50 loose coal barges passed that point.

Mississippi River.—An ice gorge broke at Alton, Ill., on the 23d. At Saint Louis, Mo., the ice gorge moved out the early morning of the 16th. Two steamboats, valued at \$70,000, were sunk near Jefferson Barracks, and other vessels were damaged; on the 19th heavy floating ice and driftwood were noted at that point.

Floating ice was reported in the Wabash River at Vincennes, Ind., on the 4th to 9th and 12th. Floating ice was noted in the Wabash at Lafayette, Ind., on the 7th. Ice in the Wabash broke at Mount Carmel, Ill., on the 2d; 16th, river full of running ice. Ice in the Illinois River passed

out at Havana, Ill., on the 26th. Ice was running in the Illinois River at Ottawa, Ill., on the 15th. At Beardstown, Ill., ice was running in the Illinois on the 23d.

Missouri River.—At Kansas City, Mo., ice partly broke on the 17th; 22d, ice gorge below the gauge caused a rise in water of 5.7 feet; 23d, ice gorge broke and river fell 6.7 feet. An ice gorge at Hermann, Mo., broke on the 16th. At Lexington, Mo., ice broke on the 23d; the river had been frozen since December 26, 1892. Ice broke at Miami, Mo., on the 24th; river clear of ice on the 28th. Ice broke at New Haven, Mo., on the 16th.

Ice in the Grand River broke at Brunswick, Mo., on the 24th. A report from Detroit, Mich., dated the 9th, stated that ice had piled up in the river at that point, and that ferryboats experienced difficulty in making their trips; on the 27th the ice moved down a short distance, but the lower ferry crossings remained frozen. On the 1st ice in the Saint Clair River moved down, leaving the river from Port Huron to the lake clear of ice; 2d, ferries resumed trips between Port Huron and Sarnia; 3d, ferry service discontinued. The harbor at Grand Haven, Mich., was blocked by ice during the greater part of the month, causing an almost entire suspension of navigation. A report from The Dalles, Oregon, stated that on the 1st the Columbia River was blocked by ice above the city, farther than ever before known; 5th to 22d, slush and ice 10 to 35 feet in thickness on the river; 23d, ice passed out; 28th, running ice.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays of February, 1893.

Date.	Station.	Extent of display.		Remarks.
		Asimuth.	Altitude.	
		°	°	
4	Eastport, Me		25	Arch of white light.
	Manchester, N. H.	110 to 215	30	Arch of diffused yellow light, with small streamers.
4	Grafton, N. H.			Arch, with streamers.
4	Northfield, Vt.	135 to 225	45	Pale green.
4	New London, Conn.	135 to 225	35	Grayish white light.
4	Penns Grove, N. J.	135 to 225		Steady glow, resembling early dawn.
4	Alta, Iowa	135 to 225	20	Arch, with very bright beams of green.
4	Duluth, Minn.	Covered 100	38	Arch of diffused light, with occasional streamers to zenith.
4	Pierre, S. Dak.	130 to 230	40	Faint display, with diffused white streamers.
4	Gaynor, Colo.	90 to 270		Red and white light and two streamers.
5	Northfield, Vt.	135 to 225	40	White light.
5	Manchester, N. H.	100 to 205	30	Faint, diffused yellow light.
5	Block Island, R. I.		40	Pale luminous beams, with a quick lateral movement.
5	New London, Conn.	140 to 230	45	Beams of white light changing to rose color, and waves of white light moving from west to east.
5	Nashville, Tenn.	In the N.		Diffused light.
5	Bismarck, N. Dak.	170 to 240	20	Pale, diffused light.
15	Manchester, N. H.	120 to 215	35	Arch of straw color, with a lateral motion; at times in the form of a curtain.
15	North Billerica, Mass.			Low arch in north, with broad beams of white light.
15	Wayland, Mass.		40	Arch of white light, with streamers.
15	New Haven, Conn.	In the N.	20	Arch of electric light color.
15	New London, Conn.	135 to 225	45	Pale yellow light changing to pale green; streamers in continual motion.
15-16	Oswego, N. Y.		20	Dim arch of white light, with occasional slender beams.
15	Grand Haven, Mich.	90 to 270	30	Arch of white light, with streamers.
15	Marquette, Mich.	135 to 225	25	Appeared in early morning as a pale, irregular arch, with streamers of various hues.
15	Medford, Wis.			Beams of light flashing to zenith at intervals.
15	Mineral Point, Wis.		30	Very bright streamers moving west.
15	Duluth, Minn.	Covered 100	70	Beams of pale diffused light.
15-16	Alta, Iowa			Bright streamers, with garnet, yellow, and purple beams.

Auroral displays of February, 1893—Continued.

Date.	Station.	Extent of display.		Remarks.
		Asimuth.	Altitude.	
15	Huron, S. Dak.	135 to 220	60	Beams to altitude 60°.
15	Pierre, S. Dak.	100 to 260	30	Luminous arch obscured by patches of clouds; streamers.
15-16	Yankton, S. Dak.			Well-defined arch with streamers.
16	Northfield, Vt.	135 to 180	45	Pale green light.
16	New London, Conn.	130 to 230	50	Arch of white light, resembling dawn.

No important auroral displays were noted after the 16th.

THUNDERSTORMS.]

Description of the more severe thunderstorms reported for the month is given under "Local storms."

Thunderstorms were reported as follows: East of the Rocky Mountains they were reported in the greatest number of states, 16, on the 27th; in 14 on the 14th and 16th; in 12 on the 15th; in 9 on the 13th, 20th, and 21st; in 8 on the 12th, 25th, and 26th; in 7 on the 17th; in 5 on the 19th and 28th; in 4 on the 1st; in 3 on the 10th and 22d; in 2 on the 2d, 18th, and 24th; and in 1 on the 3d to 9th, 11th, and 23d. There were no dates on which thunderstorms were not reported.

East of the Rocky Mountains thunderstorms were reported on the greatest number of dates, 13, in Alabama; on 11 in Florida; on 10 in Georgia, Missouri, and Texas; on 9 in Louisiana and Mississippi; on 8 in Ohio; on 7 in Arkansas and Tennessee; on 6 in Indiana and Kansas; on 5 in Illinois, Massachusetts, and North Carolina; on 4 in South Carolina and West Virginia; on 3 in Indian Territory, Iowa, Kentucky, and Oklahoma; and on 1 in Connecticut, Maryland, Minnesota, Nebraska, New Jersey, Pennsylvania, Rhode Island, and Virginia.

West of the Rocky Mountains thunderstorms were reported in Arizona on the 1st and 26th; in California on the 8th; in Colorado on the 13th; in New Mexico on the 16th; in Oregon on the 1st and 8th; and in Utah on the 12th. In states and territories other than those named no thunderstorms were reported.